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An Economic Assessment Of The Herring Purse-Seine Fleet Restructuring Plan Of 1983

The Ten-Year Management Plan at Mid-Term

Economic and Commercial Analysis
Report No. 31

Fisheries and Oceans
Pêches et Océans

Canada

AN ECONOMIC ASSESSMENT OF THE HERRING PURSE-SEINE FLEET RESTRUCTURING PLAN OF 1983

The Ten-Year Management Plan at Mid-Term

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ABSTRACT

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A reduction in the size of the herring purse seine fleet began in the fall of 1983. In 1984, a herring roe market in Japan absorbed 1,500 tonnes of Scotia-Fundy herring; in 1986 the total allowable catch was increased by more than fifty percent. The price of herring improved and the larger TAC remained for the first five years of the Management Plan. The herring roe fishery and the larger TAC's reduced the season and the excess capacity. This situation was supported by the availability of herring carriers. Although the number of vessels in the herring purse seine fleet was reduced, the capacity of the remaining vessels was enhanced. Transferable quotas had the effect of improving market access and increasing asset value for fisheries.

RÉSUMÉ

McFarlane D.A. 1989. Le plan de restructuration de la flotille de pêche du hareng à la senne coulissante (1983): Évaluation économique, la mi-terme d'un plan de gestion de 10 ans. Div. de l'anal. écon.. Rapp. No 31, Ministère des Pêches et des Océans: 49 p.

La réduction de la taille de la flottille des harenguiers senneurs a commencé dès l'automne 1983. En 1984, un créneau pour les oeufs de hareng sur le marché japonais absorbait 1 500 tonnes de hareng de Scotia-Fundy: en 1986, le total des prises admissibles augmentait de plus de 50 pour cent. Le prix du hareng a monté, et le TPA est demeuré à un niveau élevé pendant les cinq premières années du plan de gestion. La pêche au hareng rogué et les TPA élevés ont donné lieu à une réduction de la saison et de l'excédent de capacité. La présence de chasseurs pour transporter le hareng a joué un rôle positif. Malgré la diminution du nombre d'unités dans la flottille de harenguiers senneurs, la capacité des bâtiments restants s'est accrue. La transférabilité des quotas a eu pour effet une amélioration de l'accès aux marchés et une revalorisation des actifs dans le secteur des pêches.

PREFACE

The herring purse seine fishery is relatively new in Atlantic Canada. It had its first commercial spurt as a distinct fishery during World War II. However, in its short life span, it has been subject to recurring boom and crisis brought about by variations in markets, herring stocks and quality.

Up until 1970 herring was an open fishery. Periods of prosperity attracted additional investment in vessels and manpower. During periods of decline, vessels and manpower took up other fisheries as long as they were open and the equipment was adaptable to them. But as limited entry extended to more and more fisheries, movement was blocked and conversion of vessels for other fisheries costly. Declining prosperity revealed the stark reality of excess capacity. This was the situation in the Scotia-Fundy purse seine fishery in 1983.

In 1983, the price paid for herring and the allowable catch were such that purse seiners were sustaining losses. The outlook for the years ahead promised nothing better and the prospect for many purse seiners was eventual bankruptcy.

The approach adopted as a solution to the crisis of 1983 was to give each purse seine licence holder a quasi-property right in a share of the allowable catch. That share could be sold and the seller could keep the monetary reward. The buyer could accumulate extra quota which promised a greater measure of profitability. The experiment was to run for 10 years.

The fishery of 1988 marked the fifth season of the program. This study was undertaken to appraise the response of the fishery in an atmosphere of limited entry with transferable quotas.

1. INTRODUCTION

Purpose of Study

This study was undertaken to review the developments in the herring purse seine fishery following the Herring Management Plan implemented in 1983. The 1983 Management Plan was a significant departure from the traditional philosophy of fisheries management in that it gave a purse seine licence holder a quasi-property right to a portion of the annual total allowable catch (TAC) of herring in the Scotia-Fundy Region that was permanently transferable by sale and purchase. The principal objective of the Plan was the rationalization of the herring purse seine fleet. This study was undertaken, first, to ascertain to what extent the objectives of the program were being achieved at mid point in the 10-year duration of the Plan; second, to document how the purse seine fishery responded to the new situation; third, to elucidate the determinants of developments in the purse seine fleet in the interim period; and finally, it is hoped that through an analysis of the operations of the purse seine fishery, especially over the years 1983 to 1988, to provide a basis for development of future policy.

1983 Management Plan

The management plan implemented in the fall of 1983, had two principal elements germane to this review: (a) the purse seine fleets of Scotia-Fundy and the Gulf were separated, and their fishing activities were confined to the separate regions with the exception that Gulf seiners were given access to NAFO Subdivision 4Vn located in the Scotia-Fundy Region for the 10-year duration of the plan. (b) a fleet reduction program based on transferable quotas was put in place for the purse seiners. For this study, only the developments in the Scotia-Fundy Region will be discussed. (The 1983/84 Herring Management Plan and the associated press release by the Minister of Fisheries and Oceans appear as APPENDIX I to this report).

There were a number of inter-related elements to the reduction program which laid out the conditions, assurances and constraints under which it was to operate; of most interest are the following:

(a) The purse seine fleet would have 80% of the 4WX TAC.

(b) Individual purse seiners were given a percentage of the allocation depending on where they had

fished in the past. Those that fished only in the Bay of Fundy (non-mobiles) received 1.6% of the total seiner allocation; those that, in addition, had fished in 4W (mobiles) received 2.7%.

(c) A fisherman entitled to a quota could sell it; or, alternatively, buy additional quota if available. There were three important conditions to these transfers: (1) a seller had to sell his or her entire entitlement and leave the fishery; (2) the buyer could buy in small increments but with the constraint that no single fisherman could hold more than 4% of the purse seiner allocation; (3) there was a limit on those who could trade: fisherman-owned non-mobiles (see (b) above) could trade with one another only; and fishermen owned mobiles could only trade among themselves; (transfers could not occur between non-mobiles and mobiles) processors could trade quotas with other processors; fishermen could buy from processors but not vice versa.

(d) The program would have a duration of 10 years during which quotas would be maintained and no new licences would be issued to dilute the shares.

In the period leading up to the implementation of the transferable-quota program in 1983, there were many meetings and discussions involving fishermen, processors and the Department of Fisheries and Oceans (DFO). As well, surveys were conducted to reveal the economic situation of the fleet and estimates made of the annual, average tonnage at which viability for the fleet would be achieved. Given the complaints of distress it would appear that a large number of fishermen were ready to sell quotas at a price and exit from the fishery. On the other hand, no great degree of concentration would be countenanced; that is, no vessel would be allowed to accumulate more than 4% of the purse seiner allocation.

With the herring fishery of 1988, the first five years of the program have been completed. One can now assess the quasi-property rights implemented with the 1983 Plan on what has transpired and to what extent objectives and expectations have been achieved.

Background

The fishing technique of purse seining for herring has been in use in the Bay of Fundy for more than 50 years. (An early statement in that development was made by W.W. Johnson

of the Industrial Development Service of the Department of Fisheries in 1966). Although the purse seine was used previously in the Bay of Fundy to remove herring from weirs, it was in 1934 that a purse seine was used outside a weir, with oar-powered dories, to catch mature herring. Since that time the adaptation of vessels and new technology to purse seining has been continuous. Present day purse seine fishermen recognize the high-tech nature of some of the equipment they use but consider it to be standard for their fishery; yet, it is within living memory that the more primitive versions of this equipment were introduced into the herring fishery. These are the elements of the technical development that have made this fishery an efficient, fish-catching operation. The adoption of new technology contributed to and augmented the capacity of the industry. The capacity was achieved at considerable cost which, in turn, became an element in its economic problem as the fishery went through periodic crises.

Some of the major technological developments and the timing of their introduction in the Bay of Fundy herring fishery are as follows:

1934 - purse seine operated outside weirs
1936 - first powered sardine seiner
1946 - echo sounder
- radiophone
1948 - diesel powered seiner
1950 - sonar
- radar
1952 - side thrusters - Hydra-Jets
(to replace tow off vessels)
1953/54 - fish pump
1955 - power block
1957 - decked seiner
- hydraulic ram for power-block boom
- overhead seine davit
1958 - nylon seine
1962 - development of a hull form and hold for carrying herring
1962/66 - powered side roller
(Source: W.W. Johnson, 1966)

That was not the end of technological developments affecting the herring purse seine fishery; however, the list marks the introduction of significant elements in the arsenal of equipment that combined determine the fishing power of a modern purse seiner. Current technological developments most frequently take the form of improvements in the equipment and the doubling up of units, especially electronics, as insurance against failure. The introduction of new and improved equipment is most evident during periods of

prosperity when there is a strong economic incentive to do so and earnings provide, in part, at least, the resources to finance purchases.

Prosperity and crisis have been dominant characteristics of the herring purse seine fishery since its inception in the 30's. Three cycles can be identified up to the restructuring in 1983.

The first expansionary period for the herring purse seiners occurred during World War II. The general export demand for food included a demand for sardines and herring. This in turn opened up market opportunities for purse seiners and a fleet of about 40 vessels was developed between 1943 and 1945 on Campobello and Grand Manan. After the war the demand for the product declined and so did the fleet. The effect of the rapid decline on the well-being of the purse seine fishermen hasn't been recorded. The vessels and fishermen were probably absorbed into other fisheries since the seiners of that period were designed for multiple uses. During the decade of the 50's, there was little activity for purse seiners; and until 1954 purse seiners were restricted to the winter fishery, but in that year a summer fishery was permitted in an area bounded by lines between Black's Harbour to Grand Manan and Saint John. The winter fishery supported about 9 seiners; the summer fisheries only 2 or 3.

Table 1.1 Herring Meal Production on the Atlantic Coast Intermittent Years 1960 to 1976

	1960	1962	1964	1966	1968	1970	1972	1976
Pacific Coast	15,900	37,466	41,795	24,547	a)	-	a)	a)
Atlantic Coast	a)	4,009	4,177	23,660	77,584	72,364	26,798	12,031

Source: Canadian Fisheries, Annual Statistical Review, DFO Ottawa.

a) Volume too small or plants too few to report separately.

The decade of the 60's saw a dramatic growth spurt in the herring fishery of Atlantic Canada. Table 1 shows the cresting and collapse of the west coast herring meal fishery and also the rise and demise of the herring meal industry on the Atlantic coast. There were a number of factors at work

in the rapid rise of the industry on the Atlantic coast: an expanding world market for fish meal; virgin stocks of herring with a couple of exceptionally large year classes; a collapsing reduction (meal) fishery on Canada's west coast from which vessels migrated to the east coast; new vessels were built in the Atlantic; new plants were built and old ones expanded. This burst of expansion reached a peak in 1969 when meal production on the Atlantic coast exceeded 83 thousand tonnes. By 1976, herring meal production had dropped to 12 thousand tonnes; and in that year the use of whole herring for meal production was banned by a directive from the Minister of Fisheries.

A herring fishery to produce meal as the only end product required large volume for profitability. Catches by purse seiners increased during the 60's in Atlantic Canada and peaked at more than 400,000 tonnes in the years 1968 to 1970. From 1973 to 1979, annual catches in the Atlantic provinces were in the order of 160,000 tonnes. In 1975 there were 67 purse seiners in the Atlantic provinces with an average catch of about 2,400 tonnes. The price paid for purse seine herring in a predominantly meal producing area in South Western Nova Scotia increased from 22 dollars a tonne in 1968 to 42 dollars a tonne in 1973 and dropped to 36 dollars in 1975. The weakening price was a contributing factor in the fishery's problem; but the declining TAC in the face of a large fleet was the nub of the problem. Not enough fish for the number of vessels available or too many vessels for the fish available were really two views of the same issue.

In 1976, extensive measures were taken in an effort to enable the existing herring purse seiners to survive the crisis. First, the fish meal industry was phased out and food-fish processing encouraged. Second, a number of measures were undertaken bearing on the purse seine fleet. These included: the formation of the Atlantic Herring Fishermen's Marketing Cooperative (COOP) to control in an equitable fashion the fishing activity of the purse seiners; encouragement of ownership of vessels by fishermen; over-the-side sales were encouraged; and finally, vessel quotas for herring purse seiners were established and managed by the industry until these quotas were introduced into regulations in 1981. Limited entry into herring purse seining had been in effect since May, 1970, but no thought was given to fleet reduction although excess capacity was a characteristic of the situation.

It is interesting that following the establishing of an allocation of herring (TAC) for the purse seiners in 1972, competition for the fish intensified and that competition lead to increased capacity. The situation was expressed

succinctly by Fern Doucet in his review of that period:

> "Bigger seines, better fish finding equipment and better power equipment made it possible for all boats, from the 60 foot seiners to the 100+ foot vessel, to catch more fish. Once started, the trend accelerated with the result that by 1975 the entire quota could be caught in a few weeks."
>
> (Doucet, 1980)

The termination of the herring meal fishery created a crisis for the purse seiners in 1976. This ended the second boom period for the Atlantic herring fishery; but it was soon to be followed by a third if short-lived one.

From 1976 to 1978, the purse seine fishery experienced a progressively improving situation. First, the collapse of the North Sea herring stock and the rising price for herring in Europe increased demand and prices for Canadian herring. The price was further supported by a deficiency payment to the purse seiners by the federal government. Second, an over-the-side sale was arranged with Polish vessels at a price much higher than the domestic price for herring. Third, the season was lengthened through the new system and every crew was assured the opportunity to take its quota. Fourth, the unified management of the COOP provided equal access to the fishery and to the different markets for those who belonged, and in the years 1977 and 1978 almost all did.

The recovery of fortunes of the herring purse seiner fleet lasted only three years. In 1979, the quality of the fish declined because of small fish, "red feed", and high fat content. As the quality declined so did the amount that could be sold as well as the price paid for it. The cohesive arrangement exercised by the COOP also broke down as two groups formed separate organizations. Monitoring of quotas became difficult as vessels exceeded their quotas and catches went unreported. The quality problem could have been mitigated had all vessels carried adequate cooling systems. The latter was to be a factor in the development of the 1983 Management Plan.

The circumstances of the herring purse seine fleet deteriorated after 1979, marking the third crisis faced by that fleet after World War II. Internal studies by DFO in 1981 identified landings in the order of 4,000 and 5,000 tonnes as necessary at prevailing prices for viability of the small (less-than-65 feet) and large (greater-than-65-feet) purse seiners respectively. Thus, the stage was set

for the developments to follow. Given the TAC such an allocation was more than twice the amount that could be allowed each seiner. Price supports, subsidies, and over-the-side sales could no longer patch over the underlying situation of insufficient fish to keep all purse seiners occupied throughout the season and viable if conservation measures were to be observed; or conversely, there were too many purse seiners given the size of the TAC to enable all of them to operate efficiently. The issue of excess capacity was now recognized by the industry and it was receiving the attention of the "Task Force on Atlantic Fisheries". The report of that task force, the "Kirby Report", devoted two chapters to two issues at the core of the 1983 Management Plan: (a) vessel quotas as a device for fisheries management; and (b) reduction in the size of the herring purse seine fleet.

Methodology

Sections 1 to 7 of this report are essentially descriptive; and sections 8 to 10 are more analytical. The data used in this review are from various sources: (1) statistical documents published by government departments, chief of which will be the Department Fisheries and Oceans (DFO); (2) published government reports, again, virtually all the products of research done by or sponsored by DFO; (3) current files of DFO were indispensable in tracing the origins, development and conclusions of events which could be found in letters, memoranda, minutes of meetings and management plans; (4) a sample survey of herring purse seiners currently operating in Scotia-Fundy.

The survey of purse seiners began by drawing a random sample of twenty, or, 50% of the fleet. Sixteen interviews were completed. The names of the participants will not be revealed nor any information that might identify them. The cooperation and frankness of those who participated is recognized with appreciation. They gave freely of their time to provide details of their fishing enterprises from descriptive to financial data. Any doubtful material was excluded from the tabular compilations and analysis; so, with the qualifications that will be inserted along the way, a high degree of confidence may be placed in the data presented.

2. THE RESOURCE IN THE PURSE SEINE FISHERY

The herring resource in nature and as a marketable product has characteristics which make the purse seiner a very efficient and sometimes profitable catching machine. The natural tendency of herring to congregate in schools presents an opportunity to entrap large quantities quickly. The ancillary machine, the fish pump, removes the enclosed fish efficiently and preserves quality. In the process the fish pump removes scales, a valuable by-product, and leaves the herring a cleaner product to handle in the plant. If the vessel, at this point, stores the fish on board with some form of refrigeration, a top quality product is brought to shore.

The Atlantic herring is typically a low priced species. Its value, when stocks are healthy, derives from its volume. The purse seiners are capable of taking large volumes as described above. However, it is only when seasonal catches are commensurate with the vessel's catching ability that the operation becomes profitable at the modest prices that characterize the fishery. In other words, volume and mechanization transform a relatively poor fishery into a viable one. When prices reach the high end of their normal range, the fishery becomes lucrative.

The peculiar natural habits of the herring determine the fishing seasons in Scotia-Fundy. The herring stock of interest begins its life cycle when the adults spawn off southwestern Nova Scotia and in the Bay of Fundy sometime between July and October. The schooling which takes place at that time has provided the basis of the summer purse seine fishery. The spawning fish itself has been the basis of a profitable fishery since 1984. Once the herring has gone through its spawning cycle in southwestern Nova Scotia, it disappears suddenly from the spawning grounds to appear a couple of months later in the waters off eastern Nova Scotia - Chedabucto Bay - where it forms the basis of the winter fishery. The Chedabucto Bay fishery has the potential to provide a greater supply of raw material to the industry than it has in recent years, given markets, except for the hazard of a winter fishery caused by weather and ice.

It is believed that herring are consistent in their migratory routes and location of spawning. What is not always so consistent is the availability of fish or suitable fish to the fishery. This phenomenon is the result of: (a) great sensitivity of herring schools to fishing pressure despite the enormous quantities of fish observed in the water; (b) a sensitivity of spawned eggs and the young herring to environmental conditions so that a year class may

experience fabulous success or virtual failure. The result of these phenomena produced the variation in the availability of herring observed in recent years: the spawning herring on Western and Emerald banks in 1986; the abundance of spawning herring at the head of the Bay of Fundy in 1987 and 1988 and its absence from Trinity Ledge at the expected time in the summer of 1988.

The herring appears to go through dramatic changes in biomass that are unrelated to fishing activity. For example, the burgeoning herring meal fishery of Atlantic Canada was built on the year classes of 1963, 1966 and 1967 (Stobo et al, 1981). Another case was the collapse of the North Sea herring stocks in the late 70's and its subsequent recovery to reach enormous proportions in the 80's. Fishing has its own affect on the biomass and the demise of herring fisheries have been attributed to overfishing. The most dramatic example of a stock collapse witnessed in Atlantic Canada was the wipeout of the Georges Bank herring in the 70's due to the fishing by many nations. It is only now, twenty years later, that there is evidence of a re-establishment of that stock which is yet too weak for a commercial fishery.

It is this interaction of herring stocks with their natural environment and the result of man's exploitation that fisheries managers attempt to understand and reconcile. Managers thus rely on the input of biologists, social scientists, fishermen, and processors with the ultimate objective of conserving the herring stocks in a way that will minimize the fluctuation that takes place: (a) in the annual yields; and (b) the catches made by fishermen; and (c) the fishermen's incomes.

3. THE PURSE SEINERS OF SCOTIA FUNDY

Characteristics of the Vessels

There were 40 herring purse seiners in Scotia Fundy in 1988. Twenty-four of these were less than 65 feet in length overall (LOA) and sixteen were greater than 65 feet LOA.

The data on the the purse seiners presented below were obtained from the sample described in Section 1, Methodology.

The herring purse seiners of Scotia-Fundy are mostly specialized herring fishing vessels. A few can be used in other fisheries. This dual purpose was typical of the earlier purse seiners built in the region, but new vessels are more specialized in design and equipment. The principal characteristics of herring purse seiners of Scotia-Fundy are stated in Table 3.1.

Table 3.1 Descriptive Data of a Sample of Herring Purse Seiners in Scotia-Fundy

	VESSELS	
	Less-than-65-ft.	Greater-than-65-ft.
No. in Sample	10	6
Average Length (ft.)	62	92
Average Gross Registered Tonnage	56	210
Average Brake Horsepower	312	711
Average Carrying Capacity (t) (chilled)	46	145
Average Age (yrs.)	19	17
Average Years Owned	10	6
Type of Cooling Employed		
RSW	10%	50%
CSW	30%	0%
Ice	60%	50%
Type of ownership		
sole ownership	60%	17%
processor	0%	33%
private incorporated	20%	33%
partnership	20%	17%

An average only conveys an accurate meaning to the reader when the deviations around it are small. That isn't the case in the descriptive statistics above, so, a few comments will be added. Regarding length over all, the average of 62 feet for the less-than-65 foot seiner is representative and the length of each vessel is quite close to the average. For the greater-than-65 foot seiner, the deviation around the average is about 25% of the average.

The deviation around the average gross registered tonnage is great. In the case of the less-than-sixty-five foot seiners, it goes up to 56% of the average; and for the larger seiners the deviation goes up to 75% of the average. Somewhat similar comments can be made about the average for the brake horsepower where the deviation ranges up to 50 percent of the average for both groups of seiners.

The average carrying capacity of the less-than-sixty-five-foot seiners was 46 tons and 145 tons for the greater than sixty-five-foot seiners. The carrying capacity varies among purse seiners and the deviation around the average is great. In both groups, those with the greater capacity are able to carry several times the tonnage of the vessels with smaller capacity.

The carrying capacity of a purse seiner is not a measure of the ability of the enterprise to catch or deliver fish since herring can be delivered to fish processors by vessels of various configurations from specialized carrier to other purse seiners. The issue of carriers will be dealt with in a later section of this report.

Original Investment and Source of Finance

Table 3.2 Original Investment in Fishing Assets

	Vessels	
	Less-than-65-ft.	Greater-than-65-ft.
	$	$
Vessels & Equipment	188,750	836,250
Fishing Gear	61,250	106,889
Licence/Quota	56,500	66,667
Total	306,500	1,009,806

Table 3.3 Average Number and Original Cost of Purse Seines Associated with each Vessel

	Vessels	
	Less-than-65-ft.	Greater-than-65-ft.
No. of Seines Owned	2.2	2.2
Original Cost	$61,250	$106,889

The original investment in the purse seining enterprises in the sample in this study is presented in Tables 3.2 and 3.3. Table 3.3 gives further detail on fishing gear and repeats the original cost of the seines owned. The original cost of total assets is an average of $306,500 for the less-than-65-foot seiners and $1,009,806 for the greater-than-65-foot seiners. The cost also includes the amount paid for quota and licences, purchased by a few owners, which are not normally seen as part of the assets of fishing enterprises. These costs appear low when compared with the cost of new vessels and seines at 1988 prices. The reason is, of course, that these vessels were built some years ago. In fact, the average age of the less-than-65-foot and the greater-than-65-foot vessels in 1988 was 19 years and 17 years respectively. The years of ownership at 10 years and 6 years respectively was less than the age of the vessels.

The age of the vessels means that they were built and equipped at a considerably lower cost than comparable vessels would be in 1988. The same comment can be made about the purse seines. The fact that some vessels changed hands meant that a complete fishing outfit, an equipped vessel and purse seines was acquired as a package. Thus, the assignment of values to the various elements of the package was somewhat arbitrary and totals were the only factual elements. The low original cost of capital relative to the cost of new vessels with modern equipment should be kept in mind when the current earnings of the sample of purse seiners is considered in Section 5.

Table 3.4 Source of Financing of Original Investment

	Vessels	
	Less-than-65-ft.	Greater-Than-65-ft.
	$ (average)[1]	$ (average)
Federal Subsidy	9,200	-
Loans:		
Fisheries Loan Board	124,750	533,033
Commercial Bank	29,400	135,000
Processing Co.	2,600	138,000
Other	4,800	12,164
Personal Investment	135,750	191,309
Total	306,500	1,009,806

1 The average is an average of observations not the number in the sample.

A breakdown of the source of financing for the sample of Scotia-Fundy purse seiners is provided in Table 3.4. The dominating source of financing for these vessels was a provincial Fisheries Loan Board. Second in importance was personal financing followed by commercial banks and processing companies.

Table 3.5 Average Debt Position of Herring Purse Seine Enterprises

	Vessels	
	Less-than-65-ft.	Greater-than-65-ft.
	$	$
Debt Balance January 1, 1987	126,550	542,831
New Debt, 1987	15,800	0
Principal Paid, 1987	69,950	116,465
Debt Balance December 31, 1987	72,400	426,366

The debt position of the purse seiners for the year 1987 is provided in Table 3.5. The debt of the average seiner less-than-65 feet was $127,000; that of the larger seiners was over $500,000. Few incurred new debts in 1987 since much of maintenance and improvements were financed from current income and personal resources. Both groups of vessels made substantial payments on indebtedness - $70,000 for the small seiners and $116,000 for the larger ones.

Again the reader is alerted to the fact that averages conceal the actual magnitude of the variables observed. That is to say, not all vessel owners used the various sources of finance listed in Table 3.4 and not all had debts - some were debt free.

4. RATIONALIZATION OF THE PURSE SEINE FLEET

Quota Transfers

The immediate objective of the 1983 Management Plan was to reduce the number of vessels in the herring purse seine fleet. The outlook as seen in 1983 was a TAC in Scotia-Fundy of 80,000 tonnes of which the purse seiners were entitled to 80% or 64,000 tonnes. The long-run expectation was for a TAC in the order of 100,000 tonnes per year. Given the purse seiners' allocations for 1983-84, the non-mobile seiners were entitled to 1,024 tonnes (1.6%) and the mobiles were entitled to 1,728 tonnes (2.7%). The price received on average in 1983 was $142.00 per tonne which was a blend from domestic and over-the-side sales. With these expectations the crews of the purse seiners would earn little income and vessel owners would not earn enough to be able to maintain or replace vessels.

New measures were necessary; the question was, what variables were subject to control? Prices for herring were determined in world markets; the supply of fish was determined by natural factors; no public funds were available by way of subsidy or buy-back. Thus, the only feasible option for increasing incomes in the purse seine fishery appeared to be through a program that would increase the quota for each vessel by reducing the total number of vessels in the fleet. Saleable quotas appeared as the only solution; and given the depressed condition of the fishery at the time it was believed that there were a number of fishermen in the herring purse seine fishery who would opt to sell their entitlement and leave the fishery. There were 49 vessels in the Scotia-Fundy herring purse seine fleet in 1983. Half that number of vessels and a doubling of the quota per vessel would bring a measure of viability. An even smaller fleet would have been sufficient to take the catch if efficiency were the only objective. The saleable quotas were consistent with the socio-economic bent of government fisheries policy. This approach was supported by the industry and received the approval of the Minister of Fisheries and Oceans as stated in a press release on August 2, 1983.

The expectation in 1983 was that quotas would change hands quickly. However, the experience proved to be something different, as shown in Table 4.1. By 1987, nine purse seine licence holders had disposed of their quotas; 17 had increased their quotas; and 11 had reached the 4% maximum allowable TAC to be controlled by one vessel. Further explanation and comment will be presented later in the section on summary and conclusions.

Table 4.1 Summary of Quota Transfers, Acquisitions and Accumulations from 1983 to 1987

Year	No. of Quotas Transferred	No. of Vessels Increasing Quota	Percent of TAC Transferred	Vessels Reaching 4% TAC
1983	6	8	10.2	5
1985	2	3	4.3	2
1986	-	1	-	-
1987	1	5	5.4	4
Totals	9	17	19.9	11

Quota Values

It was pointed out earlier that one vessel could not accumulate more than 4% of the purse seine portion of the TAC. Sellers were parting with 1.6 or 2.7 percent of that TAC while buyers could buy up to 2.4 or 1.3 percent, which meant some quotas had to be broken up and some had more than one buyer. The values received for the quotas transferred were picked up in the sample survey and enough purchasers were included to give reliable estimates of the values involved. The values recorded were for the first sale and do not include values for portions resold by buyers that had accumulated in excess of the 4 percent allowed.

Table 4.2 Average Prices Paid for Quotas Transferred and Bidding and Asking Prices in 1988

	Vessels	
	Less-than-65-ft. $	Greater-than-65-ft. $
Price Paid per 1% of TAC*	96,875	76,932
Willingness to Pay per additional 1% of TAC	87,500	no data
Price to Sell per 1% of TAC	265,625	207,625

* Anyone who bought a quota of 1.6% of the TAC from the owner of a less-than-65 ft. vessel would have paid on average $96,875 x 1.6 = $155,000. Other exchanges may be estimated in the same way.

The prices for quota presented in Table 4.2 are stated in terms of price per 1 percent of the TAC. This makes it possible to compare the prices paid with the prices asked when the amount transferred differed.

The fishermen were asked how the price for the acquired quota was determined. No complicated formulae were employed. The answers were a variation of: that was the going price or the fishermen thought they could manage the financing of the purchase.

Table 4.2 reveals some maybe unexpected contrasts. The smaller seiners paid more for a unit (1%) of quota than did the larger seiners. Those smaller seiners with less than 4% of the TAC were still willing to buy more TAC if more were available at their bidding price. There was insufficient data from the larger seiners in the sample to reveal their position. The asking price for quota was in stark contrast to the price offered for additional quota. In the case of the smaller seiners, the asking price was three times the offered price. With this gap between a bid and asking price, few quotas can change hands. The reason for the wide difference could be due to the fact that the fishermen interviewed had given little thought to the question; furthermore, they were not faced with someone wanting to buy quota.

The difference in the price paid for 1% of the TAC between the smaller and larger seiners cannot be explained quantitatively with the data at hand. If the tonnage delivered by the purse seiners sampled for the 1983 survey were available, the cost per tonne could be accurately estimated. If average cost differed, that would be basis for different values for additional quota. Unfortunately, accurate catch data were not available for 1983 nor for the sample for 1986-87. An attempt to relate average cost figures to the quota available to the purse seiners in 1983 showed a slightly lower cost per tonne for the less-than-65-foot purse seiners than for the larger ones but the difference was slight and not enough to explain quantitatively the different prices paid for quota. In any case, such a methodology doesn't produce reliable results.

5. ECONOMIC PERFORMANCE

The objective of reducing the fleet of herring purse seiners was to increase their profitability through a program that would increase the tonnage available to each vessel. The data presented in Table 5.1 show that in the years 1986 and 1987 the profitability of these vessels had increased from that observed in 1983. That profitability can be attributed in part to the intended objective of a smaller fleet but more importantly it was the result of the unforeseen developments of: (a) a market for herring roe that blossomed in 1984, and (b) an expanding biomass of herring in the waters of Scotia-Fundy which gave more fish to each vessel. Over-the-side sales provided a valuable but declining supplement and was of secondary importance.

Revenue and Expenses

Table 5.1 Average Revenue and Expenses for Scotia-Fundy Herring Purse Seiners 1983, 1986 and 1987

	Vessels					
	Vessels-less-than-65 ft.			Vessels-greater-than 65 ft.		
	1983	1986	1987	1983	1986	1987
	$	$	$	$	$	$
Herring Sales	190,723	339,354	418,748	269,245	755,949	582,058
Expenses:						
Crew	73,446*	173,185	220,318	117,623	304,605	241,427
Operating	50,526	22,802	30,947	45,142	72,699	57,699
Maintenance	16,831	20,688	33,857	55,083	100,357	109,506
Fixed	24,233	21,827	22,194	49,081	81,199	72,878
Total Expenses	165,036	238,502	307,315	266,928	588,860	481,510
Cash Returns	25,687	100,852	111,433	2,317	197,089	100,548
Depreciation	27,950	16,171	24,720	48,877	59,971	62,943
Crew Earnings as percentage of fish sales	39	51	53	44	40	41
Net Profit	-2,263**	84,681	86,712	-46,560**	137,118	37,605

* Crew earnings include regular shares paid to the crew and the skipper as well as any bonuses earned by them.

** This number differs from that shown in the initial publication of the 1983 data. Adjustments were made to make the accounting method closer to that adopted for the 1986 and 1987 analysis.

The data in Table 5.1 on revenue and expenses were obtained from a sample of Scotia-Fundy herring purse seiners for 1983 and from a separate sample for the years 1986 and 1987. An adjustment was made to the 1983 data to make them more comparable to the data for 1986 and 1987. The adjustment involved substituting interest payments for the opportunity cost of capital. It would have been appropriate to adjust downward the amount allowed for depreciation, but there were insufficient data to make that adjustment. The effect of the interest adjustment was to reduce expenses. The effect on the net profit in Table 5.1 was to improve somewhat the position of the average purse seiner of both sizes operating in 1983 relative to that in the initial presentation of the results of that survey. However, net profits still remain negative.

The earnings of herring purse seiners from herring sales more than doubled in 1986 and 1987 from the 1983 sales except for the vessels less than 65 feet in 1986 which increased by about 80 percent. This outcome was the result of an increase in both price and quantity of herring sold by the herring purse seiners.

New Markets, Improved Stocks

Table 5.2 Herring Roe Production in Scotia-Fundy 1984 to 1988

Year	1983 m.t.	1984 m.t.	1985 m.t.	1986 m.t.	1987 m.t.
Roe production	a)	1,471	3,917	2,471	3,508

a) Volume too small or plants too few to report separately.

One of the factors that contributed to the improved profitability of the herring purse seine fishery was the sudden emergence of a demand for the Atlantic herring roe from Japan. No separate figures on the landing and value of the herring going to roe extraction were recorded; so, Table 5.2 will have to serve as a proxy for that development. With a benchmark yield of 5%, the importance of the herring roe market to this industry is revealed. No herring went to roe production in 1983; 49,000 tonnes went to roe in 1986; 70,000 tonnes went to roe in 1987. With a limited and weak food fish market, the roe fish market was unquestionably the major element in the success of the purse seine fishery in the years 1986 and 1987.

Table 5.3 Individual Vessel Quotas of Scotia-Fundy Herring Purse Seiners 1983 to 1988

Fleet	Amount of a Single Quota	1983 m.t.	1984 m.t.	1985 m.t.	1986 m.t.	1987 m.t.
Mobile	2.7% TAC	1,713	1,728	2,700	2,430	3,175
Non-mobile	1.6% TAC	1,087	1,024	1,600	1,440	1,882
Max. Quota	4% TAC	-	2,560	4,000	3,600	4,704

The second development that contributed to the success of the herring purse seine fishery was the increasing biomass of herring and the increased TAC following 1983. In 1983 one quota represented 1,087 tonnes and 1,713 tonnes for the non-mobile and mobile fleets respectively. In 1986, these quotas increased to 1,440 and 2,430 tonnes and in 1987, they increased again to 1,882 and 3,175 tonnes respectively. Those vessels that had accumulated 4% of the purse seiner TAC were entitled to 3,600 tonnes in 1986 and 4,704 tonnes in 1987. From 1983 to 1987, a single quota increased in tonnage by 84 per cent. In short, the roe-herring fishery, boosted by a rising allowable catch, were the two most important elements in the rising profitability of the herring purse seine fishery of Scotia-Fundy.

Table 5.4 Over-the-Side Sales of Herring in Scotia-Fundy, 1983-1987

Year	Total Sales t.	Total Value ($000)	Average Price $
1983	16,475	3,955	240
1984	17,706	3,108	176
1985	11,686	2,117	181
1986	2,808	504	179
1987	7,085	1,137	160

Source: Statistics Division, DFO. Unpublished data.

Over-the-side sales (OSS) to foreign vessels were another element in the market for Scotia-Fundy herring during the 1983-1987 period. However, the volume of herring sold over-the-side as well as the price paid for it were on a declining trend. These sales were a source of controversy during that period. They were opposed by domestic processors because they diverted herring from a limited TAC to foreign processors and because they had the potential of

interfering with traditional markets for Canadian herring. They were sought after by the purse seiners because of the higher price offered by the foreign buyers relative to the domestic price for food herring. These sales were, thus, more important in improving the financial position of the purse seiners at the beginning of the 1983-1987 period than at the end of it as the domestic roe herring market expanded with the attendant higher price.

The average price paid for purse seine herring did not rise immediately after 1983 when it was $142 per tonne (See Appendix II). However, it was $199 in 1986 and $182 in 1987, the years in which the sample used here was taken.

To conclude, it would appear that the fleet reduction that took place played a relatively small part in the improved financial position of the fleet in 1986 and 1987. Certainly, those who had more than the minimum quota had the opportunity to benefit therefrom; nevertheless, that gain was overshadowed by the improved markets and the greater allowable catches.

Return to Labour and Invested Capital

A comment is in order on the manner in which the shares paid to skippers and crewmen were determined for this study (see Table 5.5). In just about every case the amount paid to labour on the vessels was obtained from income statements. Two systems of reporting labour payment were identified in the income statements. In the first, the income statement for a purse seining operation showed the total amount paid in bonuses and shares to the skipper, other officers (mate, engineer, cook) and crew. Using the lay arrangement employed by the accountants for the vessels for calculating crew settlements, the distribution between the skipper and other crewmen was determined for each vessel in the sample. The amount going to the skipper is exact. The amount shown for the crew includes the bonuses paid to other officers. This approach would apply generally to the vessels in the greater-than-65-foot class.

In the second system, the skippers did not take a bonus when crew shares were calculated. In these cases, the amount attributed to the skipper is the same as that of a crewman. This situation was typical of the less-than-65-foot vessels; hence a similarity of earning will be observed for skipper and crew in this class. The effect is an understatement of the amount going to labour and entrepreneurship and an overstatement of the amount going to capital or vessel owners.

Table 5.5 Average Returns to Skippers and Other Crewmen 1983, 1986 and 1987

	Vessels					
	Vessels-less-than-65 ft.			Vessels-greater-than-65 ft.		
	1983 $	1986 $	1987 $	1983 $	1986 $	1987 $
Skippers	12,486*	29,469	36,929	25,877*	61,909	58,769
Other Crew Total Share	60,960	143,715	183,389	91,746	191,929	182,631
Number	5	5	5	6	6	6
Average Share	12,192	28,743	36,678	15,291	32,299	30,438
Net Profit	-2,263	84,681	86,712	-46,560	137,118	37,605
Return on Original Investment	deficit	28%	28%	deficit	14%	4%

* The skippers' share for 1983 is an estimate based on the percentage the skippers' share bore to total crew (skipper plus other crew) earnings for the years 1986 and 1987 combined. It was also assumed the crew sizes were the same in 1983 as in 1986 and 1987.

Tables 5.1 and 5.5 indicate that a marked improvement took place in the earnings of labour and capital of the herring purse seiners between 1983 and the years 1986-87. The earnings of skippers and crewmen more than doubled and in some cases, tripled. The return to capital owners went from a loss in 1983 to substantial profits. The earnings of skippers and crewmen on the smaller purse seiners increased by 17 to 24 thousand dollars per year. For the larger vessels the earnings of skippers increased by 33 to 36 thousand dollars per year; for crewmen the increase was 15 to more than 30 thousand dollars per year.

The returns to capital for the smaller purse seiners went from a loss of $2,000 in 1983 to profits of $85,000 and $87,000 in 1986 and 1987 respectively (an earlier comment indicated this was likely an over statement). The latter produced a return on original investment for the smaller purse seiners of 28% for both 1986 and 1987. The return to original investment for the larger purse seiners went from a loss of $47,000 in 1983 to profits of $137,000 in 1986 and $38,000 in 1987 which as a return on original investment amounted to 14 percent in 1986 and 4 percent in 1987.

Representativeness

The change in the economic performance of the greater-than-65-foot purse seiners between 1986 and 1987 as shown in Tables 5.1 and 5.2 raises the question as to whether the sample used in this study tracks the performance of the industry in those years and is, thus, representative. Table 5.6 below describes the performance of the two segments of the purse seine fleet and the changes that occurred in aggregate between 1986 and 1987.

Table 5.6 Recorded Landings and Landed Value by Scotia-Fundy Herring Purse Seiners, 1986-1987

Vessels	Landings		
	1986	1987	Change 1986 to 1987
Less than 65 ft.	30,340 t	40,665 t	+34%
	$6,053,000	$7,392,000	+22%
Greater than 65 ft.	37,678 t	49,337 t	+31%
	$7,518,000	$8,968,000	+19%

Source: DFO Statistics

Since the economic performance of the vessels sampled in 1988 reveals only average value of herring sales, the relevant data in Table 5.6 are landed values. The table shows, from 1986 to 1987, for all the less-than-65-foot purse seiners, an increase in landed value of 22%; for all the greater-than-65-foot purse seiners, it shows an increase in landed value of 19%. The herring sales of the less-than-65-foot purse seiners in the sample (see Table 5.1) increased by 23% from 1986 to 1987; for the greater-than-65-foot purse seiners the sales decreased by 23% from 1986 to 1987. The smaller seiners in the sample tracked the performance of the fleet almost identically; the larger seiners went against the trend. This is an aberration in the sample. Thus, the performance of the greater-than-65-foot purse seiners in the sample in 1987 is not representative of that segment of the fleet and the true performance is considerably better. That is, the true averages should show higher sales, maybe higher expenses, higher skipper and crew earnings and higher net profits.

6. FLEET IMPROVEMENTS

The periods of construction of herring purse seine vessels appear to follow the cycles of the herring fishery. Table 6.1 shows, in 5-year periods, the time of construction of the 40 purse seiners in the Scotia-Fundy herring fishery in 1987. Most of these vessels were built in the decade of the 60's during the period of the burgeoning herring meal industry. The low point in construction was in the years leading up to the 10-year Plan of 1983. Despite the ups and downs, the construction has been continuous.

Table 6.1 Distribution of Herring Purse Seiners Licensed in 1987 by Period of Construction

Years	No. of Vessels
1955-1959	1
1960-1964	5
1965-1969	19
1970-1974	5
1975-1979	4
1980-1984	2
1985-1987	4
Total	40

Table 6.2 Vessel Replacement and Upgrading

	Vessels	
	Less-Than-65-ft.	Greater-Than-65-ft.
Vessel Replacement		
New	3	0
Used	1	3
Increased Carrying Capacity	4	2
Average Increase (t)	16	18
Percent of Current Capacity	35	12
Upgrading to:		
Hull	3	1
Power block & hydraulics	2	1
Fish pumps	5	5
Electronics	5	2

Table 6.2 lists the changes that took place in the purse seiners in the study sample. The improvements in the sixteen vessels between 1983 and 1988 were of various forms: (a) fishermen acquired new vessels or replaced old vessels with improved vessels; (b) the carrying capacity of the vessels was increased in the new vessels but also in the upgrading of fish holds in older vessels; (c) vessels were equipped with ever improving technical equipment such as power blocks, fish pumps, and fish finding electronic equipment.

Fishermen acquire improved vessels and equipment, presumably, because it is profitable to do so but also because of improved safety and comfort. The early multi-purpose boats are being replaced with specialized vessels. The added carrying capacity if supplemented with cooling equipment maintains quality of the delivered fish. It also increases the earnings of vessel and crew if carrying charges, which have ranged up to $40.00 per tonne, are avoided. The technological aids to fishing are quite evident on herring purse seiners and Table 6.2 gives some indication of the readiness of owners to acquire this equipment. New power blocks make it possible to haul in nets quickly which is a useful feature when fishing in more risky locations. Improved fish pumps provide speed and minimize damage to the product. Newer electronic equipment makes it possible to detect fish at greater distances and speed up the process of fish finding; that is, reduces searching time.

Table 6.3 Average Investment in Upgrading of Purse Seiners by Category, 1983-1987

	Vessels	
	Less-Than-65-ft.	Greater-Than-65-ft.
	$	$
Hull	11,800	40,000
Power	0	4,667
Deck Equipment	6,500	42,833
Electronic Equipment	11,300	17,583
Total	29,600	105,083

In attempting to establish what was upgrading and not replacement and maintenance, it was necessary to rely on

the judgment of the fisherman. Thus, only those elements that were considered improvements were included in Table 6.3 and Table 6.4

Table 6.4 Average Source of Financing for Upgrading Herring Purse Seiners, 1983-1987

	Vessels	
	Less-Than-65-ft.	Greater-Than-65-ft.
	$	$
Federal Subsidy	0	8,333
Provincial Subsidy	3,500	0
Commercial Bank	2,500	0
Processing Firm	0	22,417
Owners Investment	23,600	74,333
Total	29,600	105,083

The investment in upgrading which took place from 1983 to the time of the survey in 1988 amounted to an average of $30,000 for the less-than-65-foot seiners and $105,000 for those greater than 65 feet. Not all vessels made such investments so that the actual investment of some of those involved was considerably greater than the average. The sources of financing for upgrading appear to have changed from past years. There were small subsidies from both provincial and federal governments but the occurrence of subsidies were few. No loans were obtained from Fisheries Loan Boards for upgrading. Some processing firms provided funds, but the principal source of funds was the vessel owner who put up 79% in the case of the less-than-65-foot vessels and 70% for the larger seiners.

While a number of vessels have been removed from the Scotia-Fundy herring purse seine fleet since 1983, the fishing power of those remaining has increased.

7. CARRYING AND THE USE OF CARRIERS

Herring carriers are an historic part of the herring fishery. They started as a necessary adjunct to the weir fishery where specialized carriers continue to be used. The earlier versions of the purse seiners built in the Bay of Fundy had limited or no carrying capacity; thus, carriers were necessary to their operations serving both to carry herring and as a tender. Most purse seine fishermen can catch more herring on any given day than their vessels can carry and unless the surplus fish is given to other fishermen, it is placed on carriers for delivery to a processing plant, or, discarded. The evidence available suggests that carriers have been an integral part of the herring purse seine fishery and an important determinant of its capacity.

Table 7.1 Herring Carrying Activities By and For Purse Seiners, 1987

	Vessels	
	Less-than-65-ft.	Greater-than-65-ft.
Portion of own TAC carried for others in 1987	0%	1%
Portion of TAC carried by others	53%	6%
Of sample, percent using:		
Any carriers	100%	50%
Specialized carriers	90%	33%
Crab boat	10%	17%
Purse seiner	20%	-
Lobster boat	60%	-

The use of carriers is still widespread in the Scotia-Fundy herring purse seine fishery. Table 7.1 presents data from the sample survey used for this study, and the extent of the dependence of purse seiners on carriers is revealed. First, little carrying was done by purse seiners for other purse seiners in 1987. Purse seiners are of lesser importance than other types of carriers to those who depend on carriers. Second, all of the less-than-65-foot purse seiners depend on some sort of carrier. Third, 53 percent

of the TAC allocated to the small purse seiners was taken to processing plants by carriers, and they depend principally on specialized carriers to be followed in importance by lobster boats and then other types.

The small amount of herring carried for others by purse seiners in 1987 is in contrast to the situation in the early 80's when herring stocks were depressed. Then purse seiners with facilities for chilling the herring carried fish to supplement their incomes. With the higher quotas available in 1987 there was less time to carry fish for others since rewards were higher in catching and selling the owned quota.

The extensive use of carriers by the smaller purse seiners is a function of the larger vessel quotas available in 1987 relative to their own carrying capacity. The carrier, then, is a flexible part of their fishing capacity. The prevalence of lobster boats playing the carrier role, which is something new, is an indication of that phenomenon.

8. COMPLIANCE WITH QUOTAS

Unreported Catches

Unreported catches were known in the herring purse seine fishery before 1983. But with the institution of the new management regime involving transferable quotas, unreported catches became a more serious problem because:

(a) Quotas increased the incentive to underreport catches and exacerbated the already difficult task of estimating stock size and allowable catches.

(b) Extra quota at no cost for a number of fishermen diminished the incentive to purchase quota as well as the benefits of the quota acquired at considerable cost.

(c) It appeared grossly unfair to those fishermen who attempted to adhere to a single quota that other fishermen could take additional quota with impunity.

Table 8.1 Factors to Adjust Actual Landings to Recorded Landings

YEAR	1973	1974	1975	1976	1977	1978
FACTOR	1.35	1.30	1.35	1.20	1.15	1.15
YEAR	1979	1980	1981	1982	1983	1984
FACTOR	1.20	1.45	1.55	1.55	1.63	1.77

Source: Canadian Atlantic Fisheries Advisory Committee Advisory Document 85/16

The magnitude of the differences between the actual and reported landings is indicated in Table 8.1. The estimates were developed from 1984 back to 1973. It is unlikely that these discrepancies began in 1973. A radical move was taken in the Herring Management Plan of 1985 to elicit the cooperation of the herring purse seiners in providing accurate data on catches and fishing activities. The carrot was an allocation of 100,000 t., an increase of more than 50 percent over the 1984 allocation. As a *quid pro quo* for the generous allocation, the 1985 Plan involved increased monitoring that required verbal hails, delivery notes that attempted to follow the fish from the vessel to the processing plant, purchase slips, and log records. The

measures also involved weekly licences which required a statement on the previous week's operation before a new licence would be issued. The improvement in the reporting of catches was substantial and CAFSAC did not adjust its figures for that year. Nevertheless, unreported catches were still identified.

The attempts to achieve compliance with the established quotas were costly. In 1985 the monetary cost of monitoring and enforcement was in the order of a half million dollars. The system of vessel quotas was intended to bring the capacity and catches of the fleet more into line with the available fish; the need to monitor and enforce compliance with the TAC was to be simplified and reduced; good data were expected for permanent records and biological assessment. The results showed a failure on all counts which was unanticipated at the outset. With a lack of control, went trust and mutual respect and for the time being, at least, the ability of the Department of Fisheries and Oceans to carry out its mandate to manage this particular fishery according to design.

Much could be written on the fisherman's conception of the new management regime and his motivation to report something different from the actual catch. It might be understood best in the social context of a transition from an open fishery where initiative and adventurism were rewarded by status and financial return to a rigidly regulated fishery that restrained the use of the resources at hand. This sense of being forced into a new and unwelcome mode of operation was compounded by a disagreement and/or misunderstanding of the biological factors of herring stocks and management plans that were inhibiting the fisherman's traditional style of operating. Similar comments can be made concerning the processor who buys the fish from the fisherman. Informal arrangements between processors and fishermen that were normal in the days of open fisheries are now constrained or rendered illegal by current management plans. Negotiated contracts that specified price but did not define quantity and quality opened the way to a discrepancy between the amount of fish delivered and the amount of fish paid for and reported. No fisherman wanted his quota reduced by the volume of fish for which he was not paid. There was an incentive for the buyer and seller to collude in these cases. At its worst, buyers were alleged to have demanded two tonnes for each tonne bought. Hence the expression, "two-for-one deals".

Legal and Regulatory Limitations

With the implementation of the new vessel quotas in the

fall of 1983, a concerted effort was made to see that recorded landings by herring purse seiners conformed to the quotas assigned. The herring stock was depressed, some fishermen had made a considerable investment in additional quota, and resources were committed to making the program function well. However, it soon became evident that the legal and regulatory framework for securing accurate reports of herring caught and/or landed in Scotia-Fundy were inadequate for the task. Enforcement immediately became a costly and ultimately a futile endeavour. Observed violations were numerous. In 1985, one of the better years, there were 185 written reports of violations brought to the attention of or noted by fishery officers. Charges were laid but no one was convicted for misreporting for the first five years of the program. Measures undertaken to elicit the cooperation of fishermen in accurately reporting the fish they sold proved to be to no avail.

It became evident in 1985, that the existing regulatory measures were insufficient to the task of obtaining a record of the herring removed from the water. Neither sales slips from fish plants nor log records of a purse seiner could be depended upon to yield accurate data. Thus, it appeared that a solution to obtaining the true weight of fish sold would require that the fish be weighed as it left the vessel that landed it, and additional legal mechanism would be required to prevent evasion of the weighing requirement. To that end a "regulatory package" was drafted and forwarded to the Chief of Regulations, National Unit, Ottawa, in September 1985. The arduous process of review, revision and approval was not completed by the end of the 1988 fishing season.

The long delay in obtaining a regulation that would effect mandatory weighing can be attributed only in part to the thoroughness of the process of regulatory change. It was also due to matters unrelated to this specific regulation and to the removal from the original package the section that would have granted authority to a regional director general to designate ports at which a purse seiner could land its catch. The latter element was declared to be beyond the authority that could be granted to an RDG. In the redrafted regulations, permission must be granted by a fishery officer before herring may be removed from the vessel.

The regulations governing the reporting of catches that were in place to the end of 1988 were ineffective and frustrated the efforts of enforcement officers to obtain accurate records of herring removal and sales.

Recording and Reporting Catches

During the first two years of the new program, DFO in Scotia-Fundy attempted to obtain a record of fish catches under Section 25 of the Atlantic Fishery Regulations. The relevant portions of that section are:

25. (1) Every master of a vessel in excess of 25.5 tons gross tonnage or more than 14 m in overall length shall, while the vessel is engaged in fishing, keep a fishing log book and shall record daily and accurately all information listed in Schedule XI.

(2) The fishing log book referred to in subsection (1) shall be made readily available on demand by a fishery officer and, immediately after each fishing trip, a copy of the log for that trip shall be forwarded to a Regional Director-General.

(3) The fishing log book referred to in subsection (1) shall be retained on board the vessel for a period of two years following the date of the last entry in the log book.

(4) Every person who purchases fish from a vessel shall, immediately after the purchase, furnish to the Regional Director-General or a fishery officer a copy of the purchase slip or invoice used for recording the purchase.

(5) The owner of a fishing vessel that is more than 27 metres in overall length shall, while the vessel is at sea, report daily to a Regional Director-General the position of that vessel and the weight of fish by species on board that vessel.

According to Section 25, a record of the catch could be obtained from the fisherman's log record (from the fisherman) and/or from the person who bought the fish. If the fisherman and the buyer agreed on a transaction regarding a load of herring and the fish were removed from the vessel, further questioning of the weight involved was virtually useless. One box of herring looks much like another and generally the tonnage involved was settled as a gentlemen's agreement. If, under sub-section (2), the fishery officer asked for the catch on a particular trip and was presented with figures from the log but suspected a discrepancy between what was written in the vessel log and the amount of fish in the hold, the only recourse for settling the issue was to have the fish weighed. The cost of one such weigh-out was in the order of $5,000.00.

The difficulty of such an approach is obvious if it were necessary to carry out such weighing on many vessels at several locations in unfavourable weather conditions and throughout the season. This approach to enforcement was terminated in 1985 when Section 25 was eliminated from the Atlantic Fishery Regulations in the 1985 consolidation. After that, collecting catch data was carried out under Section 61 (formerly Section 48) of the Fisheries Act. The same problems recurred. The fisherman could not, or, would not give a true weight until the fish was weighed; sales slips were not dependable, and fishermen would attempt to avoid detection and confrontation by landing their catches at an out-of-the-way location.

It was in the atmosphere just described that the new regulatory package was prepared in 1985. The relevant section as it appeared in the Canada Gazette Part II of April 26, 1989 follows.

2. The said Regulations are further amended by adding thereto, immediately after section 45 thereof, the following sections:

45.1 (1) No person who is the master of a fishing vessel shall land or permit to be landed from the vessel, at a port in Herring Fishing Areas 13 to 22 or onto a foreign ishing vessel herring caught by means of mobile gear unless:

(a) the herring is inspected by a fishery officer before it is landed; or

(b) where no fishery officer is available to inspect the herring, the master of the vessel obtains permission from a fishery officer to land the herring.

(2) Every person who is the master of a fishing vessel who lands from the vessel, at a port in Herring Fishing Areas 13 to 22 or onto a foreign fishing vessel, herring caught by means of mobile gear shall

(a) at the time the herring is landed, accurately determine the weight of the herring using scales or a volume measure having weight graduations;

(b) immediately and clearly enter into a record the weight of the herring referred to in paragraph (a); and

(c) keep on board the vessel for one year the record referred to in paragraph (b).

Two important measures in these regulations will give fishery officers control where before they had none. First, before the herring is removed from a vessel it must either be inspected by a fisheries officer or a fishery officer must give the master of the vessel permission to remove the fish. Second, at the time of landing the weight of the herring must be determined by scales or by a volume measure. If this regulatory measure stands, it will do much to eliminate unreported catches.

9. EFFECT OF QUOTAS ON FISHERMEN'S ACTIVITIES

The fishermen interviewed for this study were asked several questions on the general impact of vessel quotas on their fishing and commercial operations. Three principal questions were posed: (1) the effect of quotas on discards; (2) the effect of quotas on the availability of markets and buyers; (3) the fishermen's general opinion on quotas and the management plans that implemented them.

Quotas and Discards

There was no clear connection between quotas and the extent of discards. The existence of discarding was admitted. The strongest comment on the matter was that quotas had nothing to do with it. The most frequent comment was that discarding was minimal because there were other vessels around that would take whatever surplus resulted from a set. Some fishermen indicated that discarding took place when food fish was the target; others saw it occurring during the roe fishery.

Quotas and Availability of Markets

A few fishermen have assured markets for their catches or for a portion of the catch. Most purse seine fishermen sell to several buyers and change buyers from time to time. For a few fishermen the quota gave them access to buyers when other fishermen had filled their quotas. The latter situation was a significant impediment to quota transfers since those who had little opportunity to sell herring now had a part of the market and the incentive to sell out was reduced.

Comments by Fishermen

Most purse seiner operators consider the quota system and the plan that implemented it to have been beneficial. There were, however, a few negative comments.

A frequent favourable comment was that the possession of a quota gave the fishermen access to a market and was fair, especially, for the "small guy". They now had fish to sell which could be taken at a time favourable to the fishermen. Now that the TAC was at a high level each quota gave a claim to more fish and the fishermen could survive at lower prices. Once the fishermen had a quota this acquired a value that could not only be traded but also gave the

fishermen some negotiating power in selling his fish and obtaining credit. Perhaps the greatest benefit it has provided fishermen was that the quota became the basis for acquiring new vessels.

The quota system was financially detrimental to those who had access to markets before 1983. However, the fairness of the quota system was still admitted. Some would have preferred an even split especially since the larger quotas (2.7%) granted on the basis of a history of participation in the Chedabucto Bay fishery were now being taken, in some cases, entirely in the Bay of Fundy. This they considered unfair. The final element of unfairness derived from the lack of enforcement which enabled some fishermen to take the equivalent of extra quota without paying for it. Although there were criticisms, no one expressed an interest in eliminating transferable quotas.

10. SUMMARY AND CONCLUSIONS

October, 1988, marked the completion of five years of the herring purse seine fishery of Scotia-Fundy under the Management Plan announced in 1983, also referred to as a Restructuring Plan. The plan aimed at increasing the profitability of the fleet. This was to be accomplished through a program whereby quotas would be transferred by sale and purchase with the seller leaving the industry. The transfers were encouraged by a 10-year guarantee in a share of the TAC. It was expected that this program would lead to a reduction in the size of the fleet and an increase in individual vessel quotas. A 4 per cent limit was placed on the quota that could be accumulated by one purse seiner which also set a lower limit on the contraction that could occur in the size of the fleet, and, given the expectations in 1983 with respect to the price of herring and TAC's, a fleet approaching 25 vessels was not an unlikely outcome.

On acquiring additional quota or a new vessel, the owner was required to have an approved, circulating fish chilling system on board for quality enhancement. These quotas were to be protected for ten years. Five of those years have now passed with the 1988 summer fishery. The highlights of the developments observed in the first five years are presented in this section.

Quota Transfers

In the first five years of the fleet reduction program, 9 purse seine licence holders were removed; 17 purse seiners increased their quotas; and 11 of those reached the 4 percent maximum. Nineteen point nine percent of the purse seine allocation of fish was involved in the transfer. Six of those transfers took place in 1983, two in 1985, and one in 1987.

What prompted some quota holders to transfer (sell) quotas? Why didn't more quota holders take a capital gain on the quotas they held and leave the fishery? Six factors can be identified that will shed some light.

First, the situation of some of the vessels from which quotas were transferred could have influenced the decision. Of the 9 quotas that were transferred, 3 were associated with vessels that had sunk by the time the 1983 Plan was put in place. The poor prospects for the fishery in the fall of 1983, made the sale of the quota an attractive option. Two quota transfers took place within processing firms which made economic sense in light of the catch limitations.

Thus, two vessels could become more profitable in place of four less prosperous ones. That left 4 quota transfers from operations that were going concerns. One of the latter was a sale from a processor to a fisherman.

Second, the Plan itself imposed limits and restrictions that could have inhibited transfers. Fishermen-owners of mobile or non-mobile purse seiners could only transfer within their own classes. Either class could have bought quota from a processor but not vice-versa. No purse seiner could amass more than 4 percent of the sector allocation. Whatever the merits of the limitation placed on transfers, they may also be regarded as restrictions on transfers.

Three, the problem of unreported and under-reported catches likely meant that those fishermen involved acquired fish beyond their legal quota without paying for it. The issue of misreporting was acute in the early years, when the purse seiner allocation and individual vessel quotas were small and much less than the vessel's capability. This reduced the enthusiasm to buy quota, whether or not any more were for sale. This situation will change in the next five years if the requirement to weigh and report catches becomes enforceable.

Four, the ownership of a quota gave some fishermen improved access to markets which they had previously been denied. This was an encouragement to acquire a new vessel or improve a vessel rather than sell a quota.

Five, the recovery of the herring stock in Scotia-Fundy, and an improved price, quite unforeseen in 1983, followed within two years of the introduction of the Plan. The allocation to the purse seiners in 1985, was 35,000 tonnes above that of 1983; and the roe production has approached 4,000 tonnes (product weight). A quota now appeared to fishermen to be a very valuable asset.

Six, it would appear that the financial position of purse seine owners in 1983 was not as serious as it appeared at first sight. As Table 5.1 shows, both vessel classes experienced losses in 1983; that is, they were not covering total costs but they were covering variable costs and could therefore operate until the need for replacement or major repairs forced owners to tie up their vessels. Fortunately for both, the situation was to improve by the end of the second season. Thus, selling a quota was not an appealing option.

Economic Performance

The economic performance of the herring purse seiners of Scotia-Fundy improved significantly for the years 1986 and 1987 over their performance in 1983. The expectation at the initiation of the Plan was that, with larger quotas and fewer vessels, greater profitability would be assured. However, the principal source of the new prosperity came from a rising biomass and TAC, a new market for roe herring, and a continuing, if declining, supplement from over-the-side-sales (see Tables 5.1 to 5.4).

The earnings of seiner skippers and crewmen in 1986 and 1987 increased as much as three times the 1983 earnings. The multiples are high partly because of the abnormally low earnings in 1983. The return on original investment went from deficit positions in 1983 to a return of 28% for the less-than-65-foot vessels in both 1986 and 1987, and to 14% for the larger-than-65-foot vessels in 1986 and 4% in 1987 (see Table 5.5).

A word of caution is offered in regard to the rates of return on capital shown above. The value of the original investment shown in Table 3.2 is maybe no more than half the cost of comparable, new, fully equipped vessels in 1988. Certainly, the amount originally paid by some fishermen for the purse seines was a third or less than the cost of a new purse seine in 1988. Thus, new vessels and purse seines at current cost, with the same performance as the vessels in the sample, should show a lower return on capital than that shown in Table 5.5.

Fleet Improvements

The owners of the herring purse seiners of Scotia-Fundy made considerable cash outlays to upgrade the technical capability of their vessels between 1983 and 1987. These decisions would be consistent with behavior in an open fishery. They do not appear to be consistent with cost minimization expected with vessel quotas. They have increased the capacity of the individual enterprise, and in aggregate, the capacity of the fleet.

Some of the improvements were required by the Management Plan of 1983 for new vessels and for existing vessels acquiring additional quota. Second, vessel owners made improvements when it appeared to be profitable to do so. They increased carrying capacity, installed more efficient power blocks, more sophisticated fish pumps and electronic equipment. Third, improvements were made to the vessels to add to the comfort of the crew. The galley of a

modern purse seiner will have all the kitchen aids of a modern household. Finally, improvements are made to vessels when there are financial resources to do so. No resource access fees (apart from licences) or cost recovery charges are assessed against income that will otherwise be taxed; so taxes can be reduced by spending profits on inprovement to the vessel and its equipment. All of these elements combined to increase the efficiency of the vessel in locating, loading and delivering fish.

Purse seine fishermen financed 70 to 80 percent of the cost of improvements out of their own resources. No fisherman in the sample studied, borrowed from fisheries loan boards and little was obtained from banks for improvements. Subsidies both provincial and federal were used when they were available and a few were observed. One is left with the question: Are vessel improvements a variation of the phenomenon of entry whereby the capacity of a fleet is increased by improvements to individual vessels when fisheries are enjoying better than normal returns? More evidence is necessary to reach a conclusion.

Herring Carriers

The herring carrier is an important element in the purse seine fishery. In 1987, over half of the landings of herring by the less-than-65-foot purse seiners was delivered by carrier; the corresponding figure for the larger vessels was 6 percent. The lesser dependence by the larger vessels is accounted for by their own greater capacity to carry fish - three times that of the smaller vessels. (See Table 3.1) During the years of small TAC's there was little difficulty in landing the catch and large purse seiners carried fish for smaller ones. Nevertheless, specialized carriers owned by processing firms were taking fish from the purse seiners at all levels of TAC for a couple of reasons. First, some processing plants are located at a considerable distance from where the fish is caught and, herring is transported more economically by carriers than by purse seiners especially if fishing time were lost. Second, picking up fish from purse seiners assures fish for processing and greater quality control is exercised when the herring is delivered in specialized carriers.

Carriers played an increasing role in the herring fishery as the TAC increased after 1983 and as the herring roe industry forced most of the fishery into a very short season in August and September. These two factors along with a smaller fleet reduced and possibly eliminated the excess capacity of the early 80's. However, the availability of carriers of various types kept the herring

flowing to processors, who also increased in number following the advent of the herring roe fishery. No one reported difficulty in disposing of herring no matter how abundant.

The effect of carriers on the capacity of purse seiners goes in two directions: on the financial condition of the individual purse seiner and on the conditions of the herring stocks. Carriers made it possible for purse seiners to sell a greater volume of fish by concentrating their efforts on catching. This undoubtedly has reduced the incentive to sell a quota. If one views the availability of carriers from the point of view of their impact on the fleet's adherence to TAC, then unlimited carriers could create a problem. Carriers also made it possible for the purse seine fleet to exceed its own capacity and over-run its assigned allocation. This reduced the incentive to transfer quotas. It should be obvious then that carriers were an integral part of the capacity of the herring purse seine fleet in the period under review.

It has been reported that carriers have contributed to the problem of unreported fish landings. They are not currently licensed and their numbers are beyond the surveillance capability of monitoring resources. This issue was not specifically investigated.

Unreported Catches

Unreported catches were known in the herring purse seine fishery before the inception of individual vessel quotas in 1976 (see Table 8.1). The problem was more serious after the implementation of the Restructuring Plan of 1983 since it indicated a breakdown of fisheries management authority and the objectives of the 10-year Plan. With a breakdown in management control, catch control for conservation was lost. By the end of the 1985 season, the ability to enforce quotas was essentially lost and a fisherman aggressive enough could take extra fish beyond assigned quota at no cost.

The incentive to misreport catches is strong. The excess capacity has been the dominant but not the only contributing factor. There was a substantial monetary reward for those who succeeded in taking a catch beyond the quota. There was no effective regulation that made conviction of offenders possible to the end of 1988 simply because the master of a purse seiner was not legally required to weigh the herring catch as it was removed from the vessel. The mandatory requirements that will be in effect for the 1989 fishery: (a) permission to unload the herring and (b)

that its weight be determined as it leaves the vessel, are major advances in the establishment of control over catches and quotas.

Achievements

Despite these unanticipated adverse developments, the 10-year Plan has yielded results consistent with its objectives. Nine licences were removed and twenty percent of the purse seine allocation they controlled was redistributed among 17 vessels that increased their quota; and eleven of these acquired the limit of four percent. Those who sold did so voluntarily in a market type exchange. Equally important was the limit on entry without which there would have been an influx of vessels with its attendant capacity and pressure on stocks.

The fleet of purse seiners is now smaller, more efficient and more profitable. The tightening of regulations, to go into effect in 1989, governing the purse seine fishery with respect to reporting catches and observing quotas will do much to reverse the abuse of earlier years.

Quotas and the Fishermen

The existence of quotas had no noticeable effect on fishing operations. For the fisherman the urgency to fish was reduced; but on any given day fishing activities after the implementation of quotas were no different from what they were before.

The ownership of a quota gave some fishermen access to markets they did not have previously. By the same token other fishermen had their market opportunities reduced; nevertheless, the latter saw greater fairness in the quota system. That access to markets assured higher income, access to credit and the motivation to continue to operate in the fishery.

There were complaints of unfairness in the distribution of quotas because the basis for the distribution had changed; also there were complaints that because of a lack of enforcement some fishermen had acquired the equivalent of extra quota without paying for it. Their comments were muted because of the improved financial position of the industry in current years. Despite the adverse comments, no one suggested a return to a non-quota management regime.

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APPENDIX I

HERRING PURSE SEINE MANAGEMENT PLAN (1983) - SCOTIA-FUNDY REGION

I. GUARANTEES

The Minister of Fisheries and Oceans guarantees for ten years the following conditions for the Scotia-Fundy purse seine fleet;

a) 80 per cent of the 4WX TAC will be assigned to purse seine vessels;

b) no increase in licences

c) vessel quotas.

II. AREAS OF ACTIVITY

The purse seine fleet of the Scotia-Fundy Region will have access to the following areas:

a) 4W (Chedabucto Bay) - for an amount not to exceed 20 per cent of the total 4WX purse seine quota.

b) 4X (Bay of Fundy) - comprised of:

1. a fall fishery of 4,000 tonnes, of which 50 per cent will be under quota

2. a 2,000 tonne "brit" fishery

3. a summer 4X-5Y fishery for the remainder of the purse seine quota.

c) A separate 5Ze (Georges Bank) fishery will occur for purse seine vessels, the TAC to be determined annually.

d) Any Scotia-Fundy vessels will be permitted to operate in any of the 4W and 4X fisheries until its vessel quota is completed. This operation will be

subject to seasonal and area quota restrictions.

III. **VESSEL ALLOCATION**

a) The Scotia-Fundy fleet of 49 vessels shall be divided as follows:

1. Class A - vessels with no history of participation in 4W in the years 1980-83 (non mobile)

2. Class B - vessels which have participated in 4W in the years 1980-83 (mobile).

b) Class A vessels will have an initial annual vessel quota of 1.6 per cent of the overall 4WX purse seine quota.

c) Class B vessels will have an initial annual vessel quota of 2.7 per cent of the overall 4WX purse seine quota.

d) All vessels may participate in any of the purse seine fisheries in 4WX.

e) The fishing year will be October 1 - September 30. All vessel quotas will be for that period or until their individual quota is caught, but not to exceed the September 30 date.

IV. **FLEET REDUCTION**

a) The Scotia-Fundy fleet of 49 vessels shall be divided as follows:

1. Class A - fisherman-owned vessels with no history of participation in 4W in the years 1980-83 (non mobile);

2. Class B - fisherman-owned vessels which have participated in 4W in the years 1980-83 (mobile).

3. Class C - vessels owned by herring processors.

A list of vessels by class is attached.

b) Buying and selling of quotas can commence in the summer of 1983. Quota combining will be sanctioned in the following format:

1. Class A can purchase Class A

2. Class B can purchase Class B

3. Class C can purchase Class C

4. Class A or B can purchase Class C providing class criterion defined in III (a) of this plan is maintained.

c) These class distinctions are for fleet reduction purposes only and do not apply to individual vessel activities.

d) The owners of licensed vessels can accumulate quotas, the sum of which cannot exceed 4 percent of the overall purse seine quota.

e) Any number of license holders can participate in the purchase of a quota. The seller must, however, divest himself of his entire quota and exit the fishery on a permanent basis, surrendering his herring purse-seine licence to the Department of Fisheries and Oceans.

f) Combining can occur at any time throughout the year.

g) When purchases occur during a fishery, the uncaught portion of the seller's quota shall go to the purchaser(s). For calculation of this amount, DFO landing figures will be used.

V. <u>VESSEL REPLACEMENT</u>

a) Length or tonnage restrictions will not apply.

VI. QUALITY REQUIREMENTS

a) Upon purchasing a quota, all purchasers must install or have a circulating fish chilling system to enhance landed quality in keeping with the Quality Improvement Program.

b) Upon replacement with a new vessel, the new vessel at time of licensing must have a RSW system acceptable to the Department of Fisheries and Oceans.

APPENDIX II

HERRING LANDINGS, VALUES AND AVERAGE PRICES IN SCOTIA-FUNDY
BY SCOTIA-FUNDY PURSE SEINERS AND ALL OTHER GEAR TYPES
1981 to 1988

YEAR	Total Herring Landings			By Scotia-Fundy Purse Seiners			By All Other Gear Types		
	M.T.	$'000	AV. PRICE $/t	M.T.	$'000	AV. PRICE $/t	M.T.	$'000	AV.PRICE $/t
1988	167,205	26,649	159.38	113,122	18,475	163.32	54,083	8,174	151.26
1987	130,459	22,378	171.53	90,000	16,359	181.77	40,459	6,019	148.77
1986	108,167	20,126	186.06	68,018	13,571	199.52	40,149	6,555	163.27
1985	143,363	21,592	150.61	99,009	14,495	146.40	44,354	7,099	160.05
1984	94,723	13,276	140.16	71,854	9,909	137.90	22,869	3,367	147.23
1983	106,093	15,670	147.70	77,570	11,060	142.58	28,523	4,610	161.62
1982	109,247	19,469	178.21	68,646	12,984	189.14	40,601	6,485	159.73
1981	113,978	16,763	147.07	70,549	10,286	145.80	43,429	6,477	149.14

Source: Table 25, Statistical Division, Department of Fisheries and Oceans, Halifax, Nova Scotia